High-Performance Flow Battery with Inexpensive Inorganic Reactants

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Team Members: MIT, Pennsylvania State University, LBNL

Project Vision

A new flow battery system that uses simple, inexpensive reactants and innovative electrolyte balance methods to deliver long duration electricity storage.

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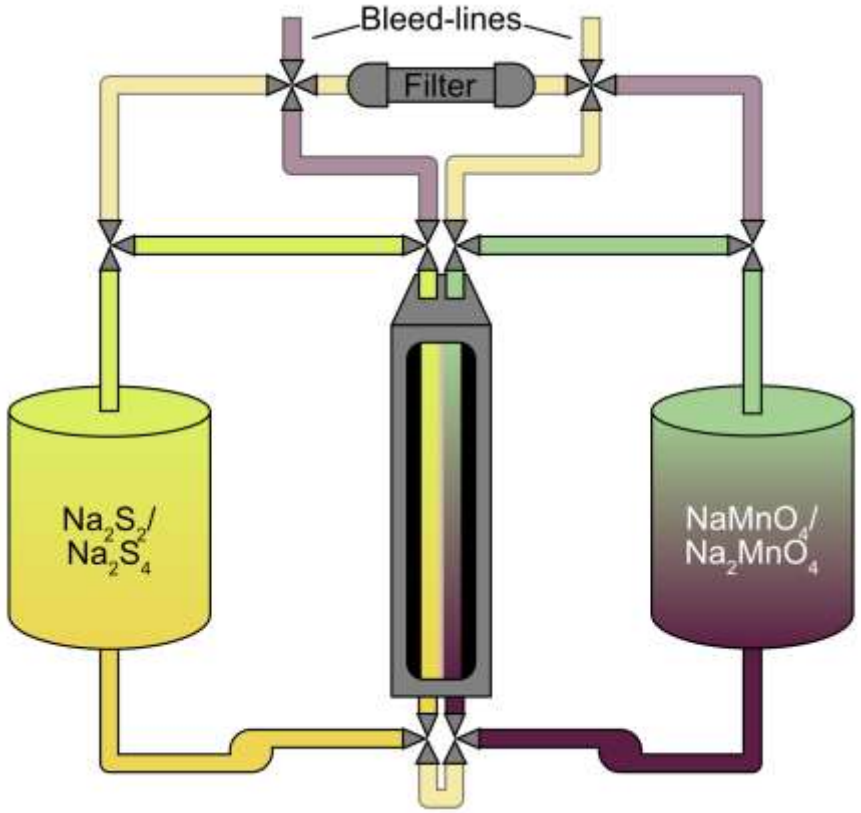
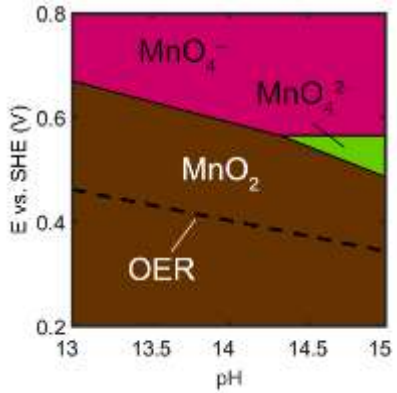
Approved for Public Release

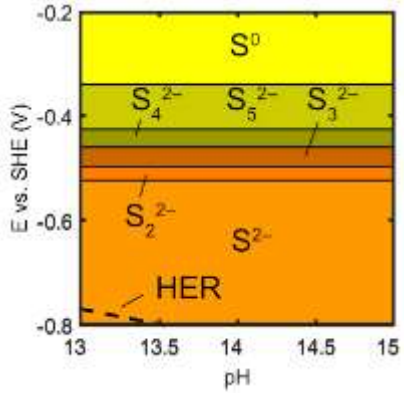
Total project cost:	$3.87M
Length	33 mo.

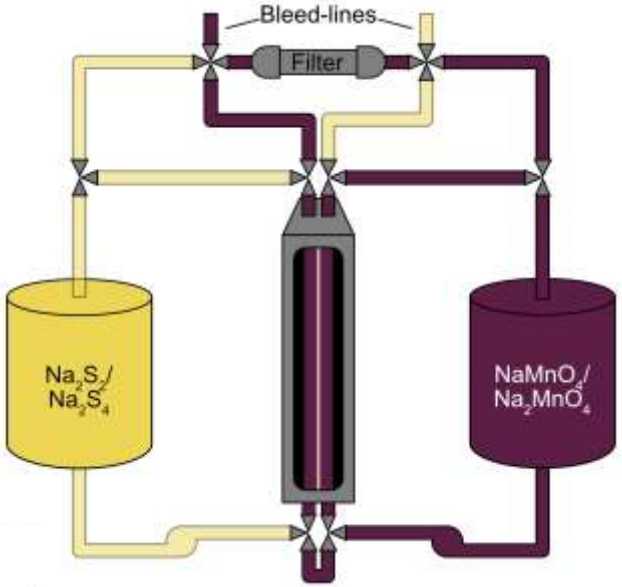
The Concept

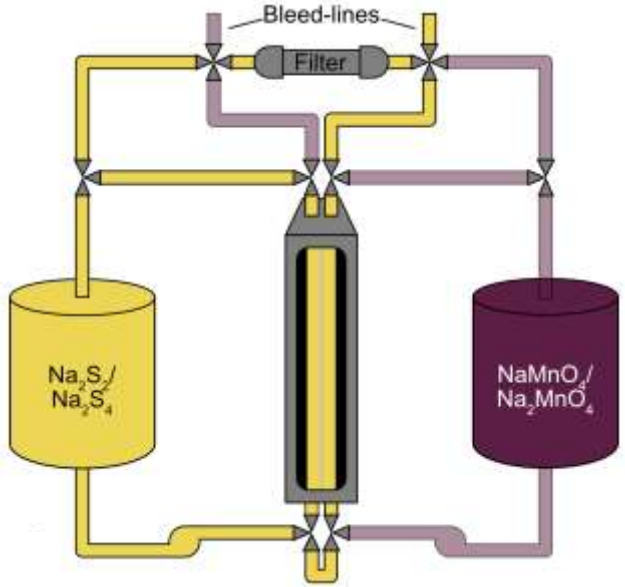
- Alkaline Sulfur/Manganese[1] chemistry
- Electrolyte Takeover Process (ETP)











1. H. Girault, *et al.* (2016). Chem. Comm. **52**(97): p. 14039

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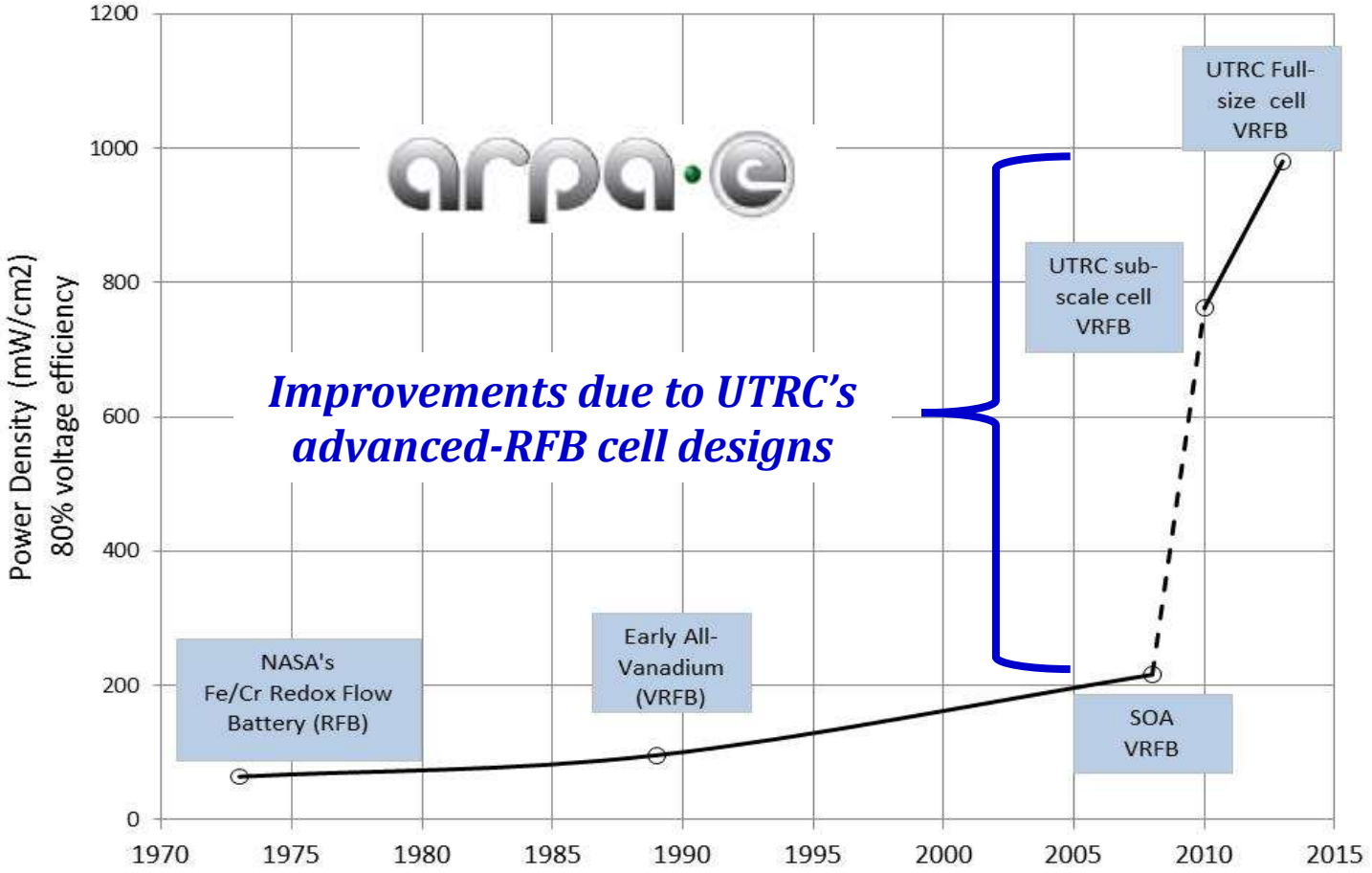
The Team

"Breakthrough Flow-Battery Stack" developed by UTRC

UTRC's VRFB cells use same material set as other VRFB cells



Commercialization by VionX Energy

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The Team

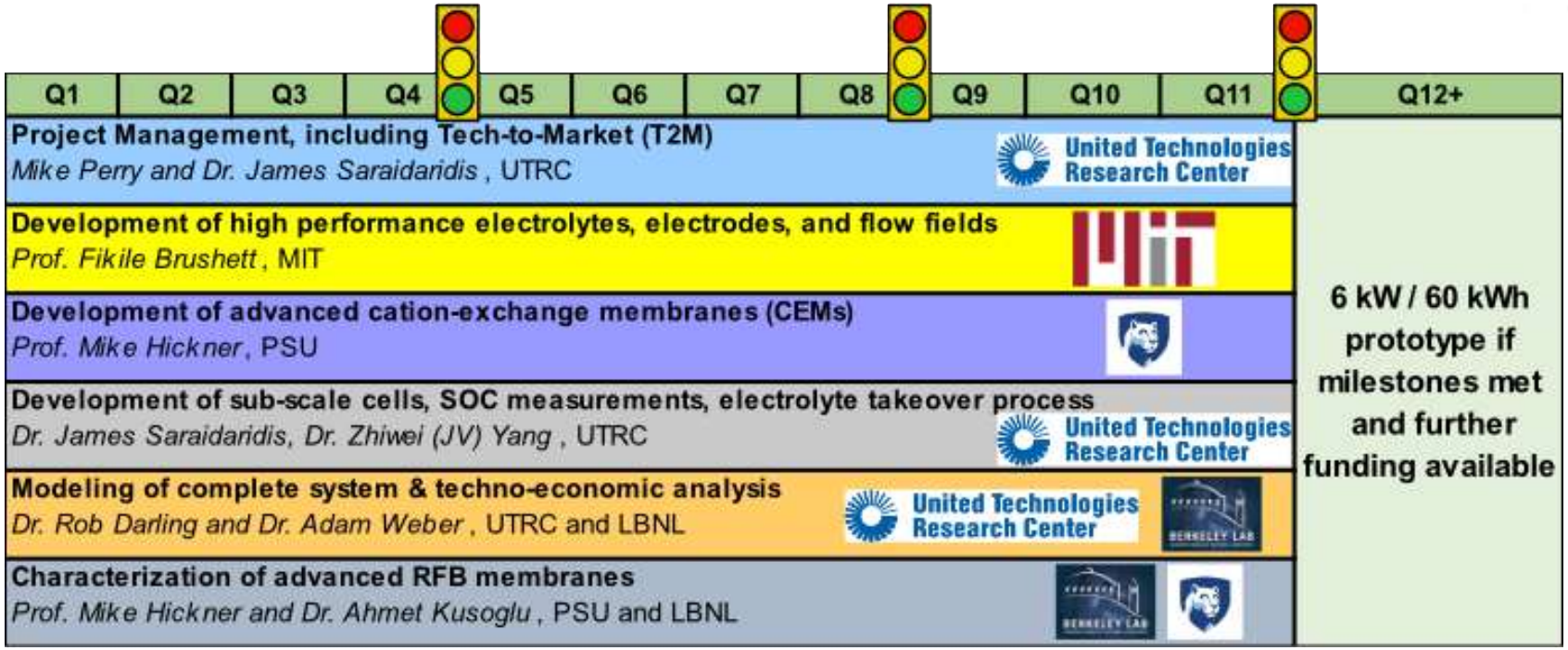
- UTRC: flow battery design, performance, modelling, and commercialization

- Brushett Group (MIT): flow battery design, performance, and modelling

- Hickner Group (PSU): polymer membrane synthesis & characterization

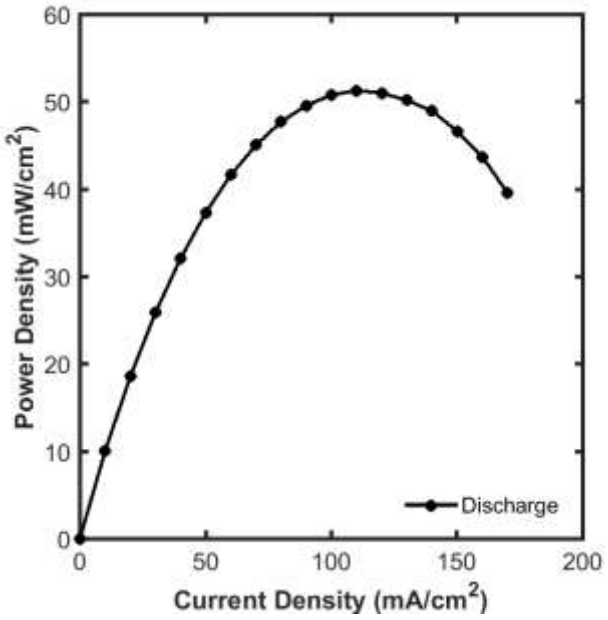
- Weber Group (LBNL): flow battery modeling & membrane characterization

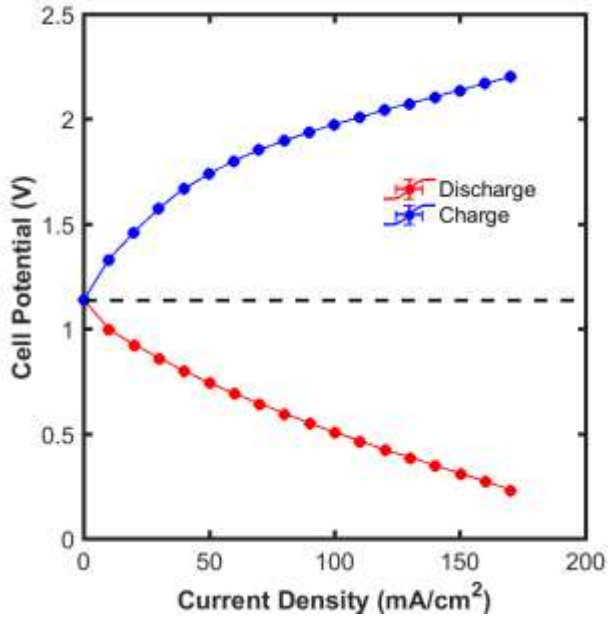
Project Objectives



Q#	Power Density (mW/cm^2)	EE (%)	Energy Density (Wh/L)	ASR (Ω-cm^2)	Capacity Loss (%/cycle)	Cycles (#)	Cycle Duration (hours)	ETP Frequency (Cycles/ETP)
Q4	25	80	≥ 30	< 3.0	< 0.4	25	5	NA
Q8	75	80	≥ 40	< 1.0	< 0.1	200	5	5
Q11	100	80	≥ 40	< 1.0	< 0.01	500/20	5/20	10

Challenges and Potential Partnerships





Challenges:

- System performance
- System stability at extreme *pH*s
  - Demonstrated for inorganic systems: AVRFBs are pH <1, S/Mn likely pH >14

Potential Partnership Areas:

- Non-fluorinated wetted materials for oxidative alkaline conditions
- Metallic flow battery electrodes
- Polysulfide catalysts